ESA 2020 Abstract**: 400 word max.**

Title:
Burn severity, microclimate, and species composition drive post-fire tree regeneration in the first two growing seasons following wildfires in the northern Rocky Mountains

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Background/Question/Methods (200 words)

Increasingly warm, dry summer conditions and associated increases in fire activity have raised concerns about the capacity of forests in the western U.S. to regenerate after wildfires. Shifting patterns of disturbance can act in concert with climate change to alter the biotic and abiotic conditions in which post-fire recovery and reorganization take place, creating the potential to catalyze rapid vegetation changes. Here we focus on the first several years after fire, which represents a critical stage in forest regeneration typically characterized by a pulse of recruitment. To elucidate the drivers of early post-fire seedling demography, we tracked seedling establishment, survival, and growth in 69 plots spanning gradients in local climate (via elevation and aspect), vegetation types (i.e., low-elevation to subalpine forest), and burn severity over the first two growing seasons after two large wildfires that burned in 2017 in western Montana. To quantify potential controls of seedling recruitment across these gradients, we measured distance to seed source (limited to $\leq$ 100 m), understory cover, and soil inorganic nitrogen availability. We also measured hourly growing-season temperature and vapor pressure deficit (VPD) in a subset of plots (n = 40) over June-August 2019 to evaluate the effects of fire on microclimate conditions.

Results/Conclusions (200)

Post-fire regeneration was abundant after two growing seasons, with seedlings present in > 90% of plots. Seedling densities (#/ha) spanned several orders of magnitude, from 0 to 442,800 (median 1625, SE 8526). This variability was explained in part by burn severity and species composition, with higher densities in plots burned at moderate severity and with pre-fire *Pinus contorta*. This pattern reflects differences in seed availability, and more buffered microclimate conditions with remaining canopy cover in plots burned at lower severity. Although soil nitrogen concentrations were higher in burned than unburned plots, soil nitrogen did not explain variability in seedling density. Annual seedling mortality was low (23%); consequently, median seedling density increased three-fold between post-fire year one and two. Despite higher daily maximum temperatures and VPD in burned compared to unburned plots (e.g., 2.8 °C warmer on average), mortality was higher in unburned plots, likely due in part to light limitation. Our results suggest that climate did not limit post-fire regeneration in these moist Northern Rockies forests under average summer conditions. Rather, seed availability and microclimate, which vary with burn severity, determined establishment patterns. Our findings support expectations that initial post-fire recruitment will influence forest composition and structure over decadal timescales.